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1889. Mar. 1.	Balance cash on hand	57.64
	Total	$1,083.17

RECEIPTS.

1889. Mar. 1.	Balance cash on hand	$57.64
	Cash received for advertising	75.00
	" " sale of Proceedings	39.23
	" " dues from members	230.00
	Total	$401.87

DISBURSEMENTS.

Printing Proceedings, and electrotypes	$375.25
Balance cash on hand	26.62
Total	$401.87

Aug. 20. Balance cash on hand turned over to C. C. Mellor, Treasurer, $26.62

S. M. MOSGROVE,
Treasurer.

REPORT OF WORKING SESSION.

By Secy. T. J. Burrill.

The working session, with Dr. Stephen Y. Howell of Buffalo, N. Y., in charge, was held in the Buffalo Library Building the afternoon of August 22, 1889, beginning promptly at two o'clock and continuing till five. The object of this session was the practical illustration and explanation of the various methods employed by workers with the microscope, each branch of microscopical technique being presented by an expert. With the exception of Dr. McIntosh, who exhibited his solar microscope and stereopticon combination in the basement, all the workers were found in the upper reading-room.

Tables 1 and 2.

L. D. McIntosh, M. D., Chicago, Ill. The use of solar microscope and stereopticon combination.

Tables 3 and 4.

R. H. Ward, M. D., Troy, N. Y. Methods of micrometry.

Table 5.

A. M. Ewing, M. D., Buffalo, N. Y. The working of a new ether-freezing microtome.

Tables 6 and 7.

George W. Rafter, Rochester, N. Y. Use of professional photo-micrographic camera and an improved method of making a microscopical examination of water.

Table 8.

Prof. A. H. Chester, M. D., Clinton, N. Y. Working of a machine for making tin cells used in exhibitor's method of dry mounting.

Table 9.

George A. Bausch, Rochester, N. Y. General constructiou of microscopes.

Table 10.

H. S. Brode, Champaign, Ills. Making paper boxes for imbedding.

Table 11.

Prof. J. D. Hyatt, New York City. Method of cutting rock sections.

Table 12 and 13.

R. R. Lansing, M. D., and R. N. Reynolds, M. D., Detroit, Mich. Paraffine method of imbedding; section cutting and mounting; mounting bacillus tuberculosis in balsam.

Table 14.

George E. Blackham. M, D., Dunkirk, N. Y. Determination of the angular aperture and working distance of objectives.

Table 15.

Edward S. Nott, Hamburg, N. Y. Method of cleaning and mounting diatoms.

Tables 16, 17 and 18.

Roswell Park, M. D., and W. H. Bergtold, M. D., Buffalo, N. Y. Preparation of culture media; cultivation of bacteria.

Table 19.

George E. Fell, M. D., Buffalo, N. Y. Method of obtaining values of eyepiece micrometer.

Table 20, 21 and 22.

Lucien Howe, M. D., Buffalo, N. Y. Preparation of nutrient gelatine for bacteria; culture of bacteria taken from the eye; staining bacteria.

Table 23.

Wm. J. Kent, Buffalo, N. Y. Circulation of blood in tail of fish.

Tables 24 and 25.

S. Y. Howell, M. D., and A. L. Benedict, M. D., Buffalo, N. Y. Staining bacillus tuberculosis; Thoma and Zeiss's apparatus for counting blood corpuscles.

These demonstrations proved exceedingly interesting to the throng of spectators who crowded the room and gathered about the tables. Question after question with answer after answer was heard as each demonstration progressed or was repeated upon the request of interested parties. To one observing the people there could be no doubt in regard to the interest manifested on all sides. The session was everywhere declared an interesting and profitable one and the exhibitors gained an abundant expression of thanks. To this general statement notes are added as follows, not especially because these were the most interesting or valuable of the exhibitions or demonstrations, but because the Secretary secured them during the afternoon.

Examination of Potable Waters.

Geo. W. Rafter's method of making examinations of potable waters consisted in taking a sample 300 centimeters and filtering through pure sand placed in the neck of a glass funnel in which it was held in place by a piece of brass wire gauze, leaving the contained micro-organisms behind in the sand. This last is then shaken up with 3 centimeters of pure water, which is then decanted, giving practically all the organisms in the 300 c. c. in 3 c. c. One centimeter of the latter is now taken and placed in a cell 50 m. m. by 20 m. m. and 1 m. m. deep, which of course is exactly filled. An accurately fitting cover is placed on the ground upper surfaces of the cell and the whole transferred to a microscope fitted with an eye-piece micrometer so ruled as to cover just one square milimeter on the slide or cell. The microscope also has a mechanical stage with rectangular movements graduated in milimeters. The slide is now systematically investigated and a count made of the micro-organisms in 50 square milimeters from which an estimate of the total number in the cubic centimeter is made. A record sheet prepared for the purpose was also shown.

Preparation of Tin Cells.

Prof. Chester exhibited a little machine for making the tin cells used in his method of dry mounting.* It consists of the stand and working parts of an ordinary notarial seal, to which has been adapted a set of steel dies and punches, the largest of these is $\frac{24}{32}$ of an inch in diameter, and cuts the disk of tin foil from which the cells of various thicknesses are made. The smallest punch takes the center out of each disk, leaving a cell $\frac{20}{32}$ of an inch in internal diameter. A third punch is used for the top rings, which holds cover glass and wire; this is $\frac{20}{32}$ of an inch and slightly tapering, so that the punched tin ring is just large enough to admit a $\frac{5}{8}$ cover glass, and the bevel of the inside edge helps to hold the wire in place. The foil for this top cell should be about 0.035 of an inch thick. With this machine, cells are made rapidly and sufficiently accurate for the purpose, making dry mounting, quick work and thoroughly permanent.

Preparation of Embedding-Boxes.

H. S. Brode's apparatus for making embedding boxes of paper consists of a cubical block temporarily attached to an upright post. A tin box fits loosely over this block. A square piece of writing paper is placed with its center over the center of the block; the sides are folded down, and corners bent around, after which the tin cap is pushed down, holding the paper in place. The block is now removed from the stand, and the corners of the paper clipped with scissors, and the sides of paper folded back upon the tin, when the box is complete; the result is very satisfactory.

Measurement of Angle of Aperture and Working Distance of Objectives.

Dr. Geo. E. Blackham kindly wrote out his method of measuring aperture and working distance, upon request of the Secretary, and it is herewith appended.

The angular aperture of an objective is properly the angular value of the difference in the path of the extreme rays of the widest pencil of rays which can be utilized by it for the production of a well defined image. Imperfectly corrected lenses may *transmit* rays more oblique than can be brought to a common focus with the less oblique central rays, but, as these rays do not contribute to the formation of a well defined image, serving on the contrary only to confuse and distort it, they have no claim to be included in the available aperture of the lens.

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* Proceedings Am. Soc. Mic., Vol. V., p. 141.

It would seem hardly necessary to argue that in order to ascertain the aperture of a microscope objective, the measurement should be made with the lens in actual use as it was intended to be used, and not as a spy glass or telescope, yet it is the telescopic method that is most frequently described and recommended in books on the microscope.

The method I use this afternoon is that used by the late Robert B. Tolles and of which he is, so far as I know, the originator. It is essentially as follows:

The objective to be measured is attached to the microscope with an eye-piece exactly as for ordinary work, and is focused on some suitable object in the center of the field, the correction collar being used if necessary to get the best image the objective is capable of giving. The object should be a transparent one, and one the resolution of which is a fair test of the powers of the lens. After these arrangements have been completed, the body of the microscope is turned horizontal, the mirror swung out of the way, and the object illuminated from below the stage by a narrow radiant, such as the flame of a toy candle. The source of illumination is then moved to the right and left in succesion, till either the center of the field becomes darkened, or the image is spoiled. The angular value of the distance through which the source of illumination can be moved before this takes place is the available angular aperture of the lens; that is, the *useful* aperture for definition. In some lenses the image is spoiled long before the center of the field is darkened, so that the aperture for mere transmission of light is much greater than that for definition. Such lenses are imperfectly corrected for the marginal rays and their performance can be improved by cutting off these aberrant marginal rays by means of stops or diaphragms, and so reducing their angular aperture (for transmission).

The plan of measurement here described, if used without any device below the stage, can measure only apertures below 1.00 numerical aperture, that is to say angular apertures of 180° air, of 98° 31′ water, or of 82° 17′ in glass or homogenous immersion fluid; and must always give the results in terms of the equivalent air angle. Hence when we have occasion to measure the aperture of lens exceeding, or indeed, closely approaching 1.00 N. A. it becomes necessary to use below the slide some device like the hemispherical lens, called by Mr. Tolles his "Traverse Lens," which being attached to the underside of the slide by an immersion contact, allows the ray to pass into the slide without refraction, and consequently gives the angle in terms of the "Glass" or "Homogenous Immersion" angle. When this device is used with a "Dry" objective or a "Water Immersion," it becomes necessary to translate the aperture indicated by the movement of the source of illumination, which is the angle in "Homogenous Immersion," into the corresponding angle for air or water, as the case may be. This is easily done by a very simple calculation founded on the "law of sines," and the rule of three, but still more easily by reference to the table of apertures, published by the Royal Microscopical Society, as part of the cover of each number of their Journal, and republished in this country in various places, of which the catalogue of the Bausch & Lomb Optical Co. of Rochester, N. Y., and the Proceedings of the American Society of Microscopists for 1883 are, perhaps, the most readily available.

The plan of measurement here outlined is sufficiently accurate for such approximate determination as are within the technical skill of the non-expert for whose benefit these working session demonstrations are specially intended. If the microscope stand is provided, as it should be, with a radial arm for the mirror and a means of reading the obliquity to which it is swung, it is easy to substitute a toy candle for the mirror and proceed as above. If the stand is *not* provided with a radial arm, the process becomes a little more complicated, but there are numerous methods for determining the angular value of the distance through which the source of illumination is moved, which will readily suggest themselves to anyone with even a slight acquaintance with mathematics and trigonometry.

If greater accuracy is desired, it can be secured by the use of an opaque slide with a transparent line across it, in which the objects are mounted; this line can be so placed on the stage as to bisect the field of view very accurately in a vertical direction, and the exact moment at which the center of the field is darkened can thus be determined with great precision. Such a slide can be readily made by cutting a 3 x 1 slip from a photo-plate, exposing it to full sunlight, developing and fixing it, and then drawing a sharp knife across it on the film side. In the transparent line thus made, diatoms or other objects can be mounted in balsam, and covered in the usual way. Still greater accuracy could be secured by the further use of a very brilliant source of illumination behind a screen with a very narrow vertical slit, or by the use of one of the tiny incandescent lamps, which are now available.

The working distance of an objective is the amount of clear space between the face of the objective and the upper surface of the cover-glass, when the object is in focus. It is a variable quantity, being affected by the special construction of the lens, the length of tube, the power and construction of the eye-piece, and the thickness of the cover-glass.

The method of measurement is so simple and obvious as hardly to need explanation, and is as follows:

I have on the body of my microscope a scale, and on the arm a vernier, by means of which I can determine the position of the body to $\frac{1}{1000}$ of an inch. I focus the object carefully and take a reading, then with the coarse adjustment I rack carefully down till the front of my objective is just in contact with the upper surface of the cover-glass, and take another reading, and the difference between the two readings is the working distance of the objective under those conditions. Stands in which the fine adjustment moves the whole tube, a plan introduced by the late Joseph Zentmayer in his Centennial Stand, are especially convenient for this work, as in them the fine adjustment can be used complete, the contact between the objective and cover-glass, and thus decrease the chances of damage to either, while in stands with the fine adjustment, moving the nose-piece only, the fine adjustment cannot be used for this purpose, as the movement of the objective effected by it is independent of the body, and consequently would not be included in the movements of the body and could not be read off on the scale.

Cleaning Diatoms.

Edward S. Nott's process of cleaning diatoms attracted much attention and the rapidity and successfulness of his work were marvellous to those that had been accustomed to other methods. His condensed directions are as follows:

1. The material must be completely disintegrated by continued boiling in a solution of sal soda.
2. The disintegrated material to be sifted in a sieve made of bolt-cloth, removing all the fine earths and broken forms.
3. The remainder to have the greater part of the sand removed from it by revolving in an evaporating dish with water.
4. The material, now mostly diatoms, to be boiled in acids. First, muriatic, then wash; second, nitric, then wash, and sometimes in sulphuric acid.
5. After washing all traces of acid away, boil once more in a solution of sal soda, wash and sift in a fine sieve of bolt-cloth.
6. The idea is to remove all the debris and waste material before using the acids, as the results will be better and at a less expense of time and labor.
7. Keep stock in alcohol.
8. Mount from best distilled water.

ANNUAL MICROSCOPICAL EXHIBITION.

The citizens of Buffalo were plentifully supplied with invitations, of which the following is a copy: "The Buffalo Society of Natural Sciences, Buffalo Library, Academy of Fine Arts, Historical Society, and Microscopical Club, invite you to be present at the eleventh annual exhibition of the American Society of Microscopists, to be held in the Buffalo Library building, on Thursday evening, August 22d, at 8 o'clock."

The response to this invitation was most generous. Some three thousand of the best citizens of Buffalo took advantage of the opportunity to view the wonders of the microscope through the lenses of two hundred and fifty microscopes, which were ranged on tables throughout the handsome library building. All of the various societies located in this building, the center of art and science in Buffalo, threw wide open their doors to the Society. The rooms of the Society of Natural Sciences on the lower floors, the Library Association on the main floor, the Academy of Fine Arts on second floor, and the Historical Society on the third floor of the building, were plentifully supplied with tables, upon which were ranged the microscopes. The objects exhibited were those ordinarily used to interest the novice. For three hours the large and interested audience thronged the bulding, which was so admirably adapted to the occasion as to prevent any crowding or discomfort. In every respect the exhibition was successful, and in many features the most successful ever given by the Society.